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Authentic Science Curriculum In An Alternative High School Setting

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AUTHENTIC SCIENCE CURRICULUM IN AN ALTERNATIVE HIGH SCHOOL SETTING

by

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CHAPTER ONE

Introduction

According to the Minnesota Department of Education more than 162,000 students are enrolled in an alternative education program making up 17% of the Minnesota student population (MDE, 2018). I am a science teacher in an alternative learning center in Minnesota and am interested in a helping my students engage and find value in their education. This project is centered around the question of: *How can science curriculum surrounding authentic tasks be created for nontraditional high school students to increase motivation and rigor*? The reason for this pursuit is that in my experience students in an alternative setting have been disenfranchised by mainstream education. They need to be challenged with curriculum that helps them solve problems that affect their lives. Science can be overwhelming for students, there is a stigma attached that science is for "nerds." Science should be a part of all of our lives since the future of our society will be shaped by how we teach science to the next generation.

We need our future citizens to be critical thinkers, problems solvers, and lifelong learners. Authentic science curriculum could be a means of shaping our future with those values embedded. The alternative education student needs to be challenged academically and socially with curriculum that goes beyond the classroom. Rote memorization and standardized testing do nothing to inspire the thinkers of tomorrow. This chapter will give insight into the characteristics of an alternative learner, establish what an alternative setting can and does offer, and explain the importance of authentic science curriculum.

Through the completion of this project, I will demonstrate that students in an alternative setting need challenging, differentiated curriculum to become the capable and questioning citizens our future needs.

The Alternative Learner

Students in alternative learning centers are at risk for educational failure. According to a legislative audit by the state of Minnesota, students enrolled in an Alternative Learning Program must meet certain criteria. "The criteria include (1) performing substantially below the performance level for pupils of the same age, (2) being behind in obtaining credits for graduation, (3) being pregnant or a parent, and (4) having been assessed as chemically dependent" (Office of the Legislative Auditor, 2009, p. x). Each student has a different reason for falling into one or more of these criteria. Poverty, unstable home lives, and mental health issues tend to be the driving factors from my experience.

According to Darling-Hammond (2010), "Among industrialized nations, the United States not only has the highest poverty rates but also has provided fewer supports and services within schools" (p. 31). Our students who are living in poverty do not have regular access to healthcare, housing, or childcare. Many times students are dealing with much more than they let on, they are trying to survive. Survival comes first, education can't compete with hunger and depression. Very often a student in an alternative setting is dealing with adult issues that take priority over their education. Students in alternative settings tend to be students of color, living in poverty, and will have changed schools more often than students in the mainstream setting (OLA, 2009, p. x). How can we help

them see that education can get them to a place that is stable, productive, and give them purpose? How do we teach our students that they can be problem solvers when they are focussing on the stresses of living with instability, poverty, and undiagnosed mental illness? All of these factors affect how a student will perform in school.

In my experience as an alternative learning center educator of three years, I am frustrated seeing that my students have the ability to be successful, but they so often refuse to do the work that we assign them. I can talk with students individually or in small groups and hear that they are understanding a concept, yet when I assign an assessment to get real measurable data, so many refuse or fail the assessment. This can be due to anxiety, lack of confidence, or the defiant behavior that so many students come to alternative settings with. There are students who refuse to do any work in class; they chose to distract themselves with technology and fail course after course. This is not because they can't read or write or solve equations. There is a lack of motivation to be what mainstream society considers successful. Instead of placing blame on these students and their lives outside of school, we need to take a look at how we are trying to educate them in the first place.

Our schools focus on transmitting knowledge efficiently in factory style models where students are told to be quiet, answer questions, and gain the basic skills that will help them get gainful employment after they graduate. This is especially true for students who are poor. The thinking oriented curriculum is generally given to affluent students (Darling-Hammond, 2010, p. 5). There are tracking systems within our schools and when the system is not working for many students they are diverted to alternative programs.

The Alternative Setting

The school I work at is comprised of 16.3% special education students and 58.2% of students are receiving free and reduced lunch according to the Minnesota Department of Education (MDE, 2018). We have a wide range of student ability and interests. Some students are going to college, some are not, and some have no idea what their future holds in the coming week. Bullock, Zolkoski, and Gable (2016) asserted that "Many students placed in an alternative education setting have a history of academic and social failure, were subjected to punitive disciplinary practice, and sometimes exclusion" (p. 232). With these factors affecting the students in alternative settings, learning needs to be individualized and differentiated. I work in a school of about eighty students with five full-time teachers, two part-time teachers, and two administrators. This allows for small student-to-teacher ratios which makes that type of individualization possible. The small size of alternative centers allows staff to work with students facing adversity and show that they care. I taught a class in the traditional high school and was traveling between the two sites. It was a major perspective change for me to witness the power of teachers having the time and space to work with students for multiple years with one-on-one contact often. Teachers in mainstream classrooms so often are given forty plus classes and cannot have those types of experiences with all of their students. Students get left behind, drop out, or act out. In the year 2000, the U.S. high school graduation rate within four years was only 69% (Darling-Hammond, 2010, p. 14). The factory type model of knowledge transfer is what works for many here. Yet I am not sure it is preparing our future for the diverse and ever changing workforce they will be entering into.

Memorization of facts and figures is not shaping our future leaders as problems solvers or critical thinkers. We are creating a workforce whose skills are focussed around studying, not doing. An alternative setting is the perfect place for a differentiated and individualized curriculum. It is here that we can help students feel that they are cared about, respected, and that they can make a difference in their own worlds. Many students coming to alternative settings speak to how they feel part of something, they know their teachers care, and that they can succeed. This is not always the experience in traditional education. According to Darling-Hammond (2010), urban high schools are discussed as "Heavily stratified within, and substantially dehumanized throughout, most students are likely to experience such high schools as non caring, even adversarial" (p. 63). Alternative settings are different. The relationships that are able to be formed create resilience and increase student motivation. With this ability to work with students on personal levels authentic science curriculum that allows for students to apply their gained knowledge to tasks that have value to them can be life changing.

The Significance of Authentic Curriculum In Science

Much of my experience in the science classroom has been trying to motivate students to learn the periodic table or how photosynthesis and cellular respiration are opposites of each other and part of a cycle that allows for life to exist. I myself was not that interested, or even curious about aspects of science until I was in college and saw how this knowledge affects our society and me individually. I try to explain this to my students, explaining that once they understand the foundations curiosity and passion will follow. Why can't we switch this process around? Start with curiosity and passion and

allow that to guide the acquisition of knowledge. When researching science curriculum Wolff-Michael Roth (2010) stated "an important aspect of interest, motivation, and learning was the level of control learners have over their life conditions in the school curriculum" (p. 4). How can we help students see themselves as a part of science? How can we help them see where they fit in? I believe it is through creating curriculum that is authentic, differentiated, and individualized and the alternative learning setting a perfect place to do this. With small class sizes and disenfranchised students teachers can help guide students away from the formalized classroom and into a way of learning that they will find valuable.

"Advances in science and technology fuel economic growth in East Asia and European nations, our students rank near the bottom of industrialized countries in math and science achievement" (Darling-Hammond, 2010, p. 3). Why is this? We are not adequately educating our children in that we are not preparing them to think about their own lives fit into these fields. Our students need to see how science can work for them. So often I hear students ask "Why are we learning this?" or "When will I ever use this?" Until our students see that science has a clear application to their own lives and communities these types of unengaged questions will persist. Strimel (2014) stated that when we allow for students to select problems and take ownership of their learning they can see the "difference between learning about engineering principles and learning to be an engineer" (p. 9).

I want my students to experience science, I want them to nurture a passion, and I want them to learn how to learn. Our future generations need to define and solve

problems through collaboration and ingenuity. This sort of thinking can be fostered through authentic science curriculum and I believe that Alternative Learning Centers are a great places to start developing this sort of curriculum. When students have freedom and support they can begin to manage their own education and work to be continually improving. Over 70% of jobs in the United States require knowledge and skills that are specialized in comparison to 5% one hundred years ago when our school systems were designed (Darling-Hammond, 2010, p.2). We need to set our future up for success and every student deserves an education that does so.

Chapter Summary

In summary, I would like to develop a curriculum that incorporates authentic tasks into alternative education science classes. In Minnesota alone students enrolled in alternative programs makes up for 17% of the student population (MDE, 2018). Alternative setting are already set up for this type of learning as they tend to have smaller class sizes and focus more on experiential learning. Our future workforce is going to require skills that include critical thinking, problem solving, and collaboration. The way we are teaching our children in the mainstream educational system is not conducive to skills our students are going to need. In the alternative setting, we have the chance to help our students be invested in and see the value in their education. If I can help students see how science can help them solve problems in their own lives they would learn so much more. Science education should be hands-on individualized. Our world is too dynamic and complex to be taught about with memorization and right or wrong answers. This is what I want my students to experience through completion of this project.

The following literature review will help me delve deeper into curriculum models and gain insight into how to accomplish this. I will be using peer-reviewed articles, curriculum, and research to discuss what the needs of alternative learners are, student motivation, existing curriculum and where priorities in science education should be.

CHAPTER TWO

Literature Review

This literature review will discuss research and other literary works that give further insight into why I chose this topic for my thesis. The sources reviewed will help answer the question of: ***How can science curriculum surrounding authentic tasks be created for nontraditional high school students to increase motivation and rigor*?** The first section reviews the needs that alternative programs and their students have, which are often unmet. There is a range of structures and philosophies among alternative learning programs, but I am focusing on sites similar to where I work. The second section reviews the curriculum that is presently used in many science classrooms and in particular mine. Every classroom is different so I am focusing more on Minnesota State Standards and the textbooks that are available to me. The third section consists of evidence that assesses the need for authentic inquiry based learning and how I see it fitting into an alternative setting. All of these factors are greatly impacted by the mindsets and motivation of students and staff in educational facilities. The fourth section discusses the importance of having positive mindsets and the impact of those mindsets on students learning science content. My hope is that this literature review can motivate and highlight the changes that need to occur within AEPs to give a marginalized group of students the best education possible.

Characteristics of Alternative Education Programs (AEPs)

Many students have not had a positive relationship with the traditional educational system. In the year between October 2013 and October 2014 around 567,000

15- to 24-year-olds left their schools without a diploma (NCES, 2018, p.iii). The physical environments of high schools can be very unfamiliar to the many students whose home cultures do not match that of the norm of their high school. “It is not surprising that many students, especially those who enter into schools that are unlike the cultures with which they are familiar, are unable to normatively handle school” (Phillips, 2011, p. 673). This difference can cause students to leave the traditional high school setting and enroll in an alternative high school program. This change can have a very negative result on students; they feel that they are now stigmatized or labeled as abnormal and cause various types of failure in school such as academic, social, or emotional (Phillips, 2011, p. 673). So often youth become disenfranchised by the lack of meaningful engagement in their classrooms or in schools in general. This coupled with the lack of parental support and a stressful home environment lead many students to leave school prior to completion (D’Elia & Wishart, 2014, p. 15). Alternative high school students face many challenges that may lead to dropping out of school that include living in poverty, traumatic or stressful life experiences, feelings of alienation in school, and academic needs that go unmet. All of these challenges lead to students being at-risk, a label that includes students who experience teen pregnancy, truancy and behavioral issues, violence-related or risky sexual behaviors, depression and suicidal thoughts or thinking, and substance abuse. Due to all of these challenges that many alternative students face they are unlikely to succeed without an intervention. Alternative settings can offer that intervention. They offer flexible educational opportunities and support that is offered by devoted and deeply involved teachers and administrators (Wisner & Starzec, 2015, p. 245).

Alternative programs are alike in that they can deviate from traditional educational settings in length of classes that are offered, small student to teacher ratio, and the actual structures of the school themselves. “The highly individualized environment takes the form of making kids responsible for obtaining credit for the courses they need to graduate, and then providing them with the support they need to succeed” (Rayle, 1998, p. 244). This individuality allows for students to have a voice and set goals. It also allows teachers an intimate awareness of their students’ lives. In order to engage and inspire students they need to be involved with the implementation of educational change. When trying to create curriculum that can motivate unmotivated students educators need to listen to the students. “Only students can tell us what is relevant and meaningful to them in terms of education” (Phillips, 2011. p. 675). The small settings allow for educators to develop positive personal relationships with students who they often have for multiple years in a row. It is imperative for the success of students that teachers provide ongoing support and show respect to their students. Nonfamily role models such as teachers, administrators, or after school program supervisors can serve as safeguards against academic failure. Students need “protective factors” that can help them overcome unfavorable circumstances (Zolkoski, Bullock, & Gable, 2016, p. 232).

Some alternative programs are no more than a separate space or physical setting to move at-risk students out of the traditional classroom. Many students need psychological evaluation that they have never gotten. Some may have undiagnosed learning disabilities or be emotionally traumatized. The reasons that students have moved

to an alternative program can vary drastically. Some students may have severe offenses such as assault charges or possession of weapons charges, have personality disorders, or merely missed too much school. These students are all lumped together in many alternative programs with little access to resources that they need. Alternative programs need to serve all of these students. According to Fuller and Sabatino (1996), there are four components that these programs should integrate into their curriculum: academic program goals, vocational program goals, social skill development goals, and personal development goals. These components are vital to individualizing curriculum and content to each student. An understanding of what each student needs and how they are able to get those needs met is put upon educators and administrators in these settings.

Often students have limited social skills due to the social conditions of their personal lives creating barriers to their academic success. Not all people see value in education. Students in alternative programs need opportunities to realize how group-based or informal learning can benefit them. There needs to be a variety of educational opportunities within a program, which can include frequent use of field trips, portfolios, or individualized learning plans to match the specific needs of each student (Rayle, 1998, p. 250). The school I work in utilizes field trips and informal learning experiences to give application and authentic knowledge transfer to the curriculum we create.

Due the small size of many alternative schools, not all teachers are licensed in the areas they teach. This creates a need for a student to be an individual learner in some cases. Some programs have observably lower standards and have regulations and

expectations that are much less rigorous than traditional schools. Some states have statutes that urge educational boards to refrain from hiring substandard teachers in alternative settings but do not explicitly bar them from doing so. At times "the settings and characteristics of AEPs create a distinct impression that the children assigned to them are undeserving of a typical public-school education. Most AEPs do not look like typical schools" (Fedders, 2018, pp. 19-20). This creates a need for students in these settings to have a voice and some autonomy in their education, but also a curriculum that is held to high standards and expectations. When teacher expectations are changed, for example due to teaching outside of their content area and not having a good grasp of the what learning looks like in that context, levels of student achievement and understanding may be lowered. "Lower expectations communicated to the students through lower curricular standards, would result in lower achievement by those students who are already at risk" (D'Elia & Wishart, 2014, p. 19). There is a need for curriculum that can align activities with state standards in a more informal setting. This curriculum needs to bring all students to higher levels of performance academically and socially. There is a need for collaboration between faculty where math, science, and special education teachers can work together to create tasks that can be individualized while also maintaining integrity and high standards (Tam, Rousseau, Nassivera, & Vreeland, 2001, pp. 77-82). I am required to teach chemistry and physics courses that are outside of my licensure. I teach these courses on a variance. This has caused confusion and impedes on the higher order thinking skills that students need to acquire in these content areas. Finding curriculum

that allows for students to learn without relying solely on the teacher has been difficult and at times impossible.

Students in alternative education programs come with a vast range of skills and needs. There are needs that need to be met academically, socially, and emotionally that are unique to the individual student. Alternative program educators need to ask questions in regard to each student surrounding what kinds of negative and positive experiences students have had in school and throughout their lives. Also educators need to examine the conditions of learning for those experiences that include the source of their prior knowledge, environmental contexts, teachers and school leaders, their social relationships, and their emotional states (Phillips, 2011, p. 676). Keeping all of this in mind, we need to remember that the curriculum needs to be rigorous and authentic. Holding all students to high standards should not be at the discretion of the educator but a requirement that all students deserve an equitable education.

Existing Science Curriculum

"Mitochondria is the powerhouse of the cell" is repeated and even chanted in my biology courses every year. Even in the other science content courses as well. It is a meme on the internet and is thought of as a joke. As one student explained to be me, it is funny because everyone remembers it but they don't know what it means. In many science classes, the students are required to memorize vocabulary and formulas but are not able to transfer that knowledge, or those memorized facts, into aspects of their lives. This type of curriculum has created inauthentic tasks that make science content something that needs to be covered or to get through. The early history of science

curriculum in North America included minimal effort to consider relevance in content and pedagogy. “Younger, not older students could have the opportunity to discover for themselves the phenomena where they naturally occur, … mainstream schools science teaching, specifically in North America, has been challenged with the issue of relevancy (D’Elia & Wishart, 2014, p. 19). The Minnesota State Science Standards for biology include 29 benchmarks that teachers are required to cover and then have their students take high stakes tests on that content (MDE, 2009). There are about 35 weeks of school which means that for each benchmark teachers can spend an average of 1.2 weeks teaching the content. In alternative programs many students have not been successful in school which means there are many gaps in their learning. To be able to formatively assess, tailor curriculum to each individual class or students, and then summatively assess them in that amount of time, in my experience, is impossible.

The teacher interleaf of the Holt Biology (Johnson, 1998) textbook, a typical biology textbook, outlines lecture concepts, but only allows forty-five minutes for each concept. In those forty-five minutes, according to the lesson planning guide for section 1-3 the teacher needs to lecture on the following concepts:

1. All organisms are composed of cells.
2. All organisms must maintain homeostasis.
3. Instructions for development are passed from parent to offspring.
4. Evolution is inherited change over time. (1998, p. 3A)

The *Modern Chemistry* textbook (Davis, Frey, Sarquis & Sarquis, 2009) has twenty-three chapters and 782 pages. This textbook includes a critical thinking section at

the end of each chapter. An example of one of these critical thinking questions is, “Is breaking an egg an example of a physical chemical change? Explain your answer” (p. 23). Although this is asking students to explain their thinking, this type of questioning isn’t requiring them to transfer their knowledge into something applicable to their lives. Why does it matter that breaking an egg is a physical change and not a chemical change? When we cover too much content without time allowed for deeper level thinking we are not allowing our students to construct their own knowledge (Tomlinson & McTighe, 2006).

There are new textbooks coming out. The new Pearson Biology text that is copyrighted for 2019 looks to identify real problems and help students understand evidence. It utilizes performance-based assessment and STEM concepts. An example is on page 34 where students are challenged to design their own hydroponics system (Miller & Levine, 2019, p. 34). With a price tag of $107.47 per book, these books are not in the budget of most alternative programs. Not only are we lacking in this type of resource, many alternative high schools do not have proper lab equipment. The classroom I work in has a sink and hot plates to use, but we are lacking outlets and the classroom design makes labs very difficult.

Our educational system has maintained a centuries old practice of moving students down an assembly line of science curriculum that starts with biology, earth sciences, then chemistry, and ending with physics. At each step of this assembly line fewer and fewer students are enrolled in science courses with an end result of only twenty percent of students within the United States taking a physics course (Mervis, 1998). The

school structure was created and is used to implement the transmission of "predetermined bits of information" (Darling-Hammond, 2010, p. 62). Darling-Hammond (2010) also pointed out that teachers are isolated from one another with little time to collaborate and develop curriculum that allows students to solve problems. In an alternative setting this can be even more of an issue. In the school I work at and in many alternative programs, there is only one science teacher. There is little time, due to multiple preps to collaborate and develop cross-curricular projects. When I took my position at this school, I had a few textbooks and some expired water testing kits. I had to develop my own curriculum for five different courses that changed every trimester. This is common among alternative high schools.

There have been efforts among school districts to create small schools or learning communities within buildings. "Smaller schools appear to produce higher achievement, lower dropout rates, lower rates of violence and vandalism, more positive feelings about self and school, and more participation in school activities" (Darling-Hammond, 2010, p. 64). This has been an effort that does not work for every environment. When schools are not funded well, they cannot produce these results. School officials find it difficult to find teachers and school leaders who are devoted to creating this type of atmosphere that produces rich curriculum (Darling-Hammond, 2010). Many students in alternative programs are considered at risk and low income. The National Partnership for Teaching in At-Risk Schools (2005, p. 3) cites a study where students who were assigned effective teachers for three years in a row scored and average of 49% higher in standardized tests than students who were assigned ineffective teachers. They also cite another statistic

stating that 43% of teachers in high-poverty school lacked a major or minor in their field (2005, p. 3). Teachers in high-poverty schools, even when they are experienced and have credentials, are often ill-equipped to handle the enormous instructional load that is often assigned in these schools. It is common to find schools with the hardest, high needs teaching assignments being staffed by the least qualified teachers (NPTARS, 2005, p. 3).

Online curriculum is also used in AEPs as a credit recovery tool. A report for the National Center of Education Statistics showed that fifty-five percent of school districts used online learning (NCES, 2011, p. 14). Some educational programs offer online courses to act as a safeguard for students who have fallen behind in their credits. Students interviewed about taking online courses say that they can be helpful to keep students from getting distracted by others, but that they would rather take class with an actual teacher and be more hands-on in their learning. Critics of online curriculum worry that schools having the option of pushing students toward online curriculum takes the onus of the schools for graduating students and delivers a sub par education (Carr, 2014, p. 32). In my experience this is very prevalent in alternative programs. Attendance is also a huge issue in these types of programs so many teachers utilize Google Classroom to supplement class time. In my experience, the students who do not attend have a very poor understanding of the content. At times there seems to be an attitude that as long the students complete the work it does not matter if they understand it or not. In a study done on the effectiveness of online biology curriculum researchers found that although students improved from their pretest scores student feedback showed a need for more immediate feedback from teachers and scaffolding to help them with evidentiary

reasoning (Marstellar & Bodzin, 2015). Often in alternative programs teachers who are facilitating online courses are not licensed in areas the students are working in which can lead to many misconceptions and lack of rigor.

Science curriculum in Alternative Education Programs, or the lack thereof, is hindering the ability of teachers in these settings to give relevant and immediate feedback to their students with the amount of prep they have to do. Teaching outside of licensure creates a lack of rigor and real understanding. After attending the Minnesota Association of Alternative Programs in 2017, I was dismayed to find the focus of many of the breakout sessions was to get students to simply be there and complete assignments. One session was focused around making miniature models of concepts with the benefit being that you could get a month of work out of it. Often I feel that there is a stigma attached to AEPs in that they are not rigourous or a quality education, which unfortunately can be true.

The Need for Authentic Science Curriculum

Science education is thought of as a crisis in many developed countries. Fewer students are choosing to pursue science careers and the response to this crisis is to reform science education. Science educators have concerns that the curriculum is irrelevant, boring and geared toward teaching only a minority of students who plan on becoming scientists (Braund & Reiss, 2006, p. 1373). Many students who attend AEPs have very negative views of science. Their resilience can be lacking when it comes to completing difficult tasks. As the content becomes more difficult to work with students tend to start missing class or giving up. If we could implement a curriculum that is more

inquiry-based they could use the support of their peers to help them preserve and thus develop more resilient mindsets. “Group learning is beneficial for inquiry learning, because it allows for the formation of a supportive climate for learning” (Zion et al, 2004, p. 59). A goal of AEPs is to help students develop positive relationships where they feel supported and valued, curriculum designed toward inquiry and authentic tasks would help promote that type of environment.

Science curriculum needs to prepare students for future careers. One of the biggest challenges in teaching science is to help students create original investigations, to take ownership of their work, and use the nature science to solve a problem. Many resources do not promote active student engagement or oversimplify concepts which can lead to students to create misconceptions. When students are given independence in a science concept they want to investigate, they take pride in their work and develop more resilience and perseverance when faced with the challenges science curriculum can present (Tarjan, Nesnera, & Hoffman, 2015, pp. 43 & 47). In an authentic learning classroom students are encouraged to pursue their own learning and develop and create solutions to problems that are real to them. Students need to be able to incorporate other content areas into their learning. In order for students to fully create the solutions to their problems, they “should be immersed in a transdisciplinary learning environment that does not have content barriers” (Strimel, 2014, p. 9). Alternative programs could allow for this type of learning to occur in that these programs have small staffs that tend to know each other well and work in PLCs together.

Student motivation toward science tends to dwindle as students progress through their educational career. Theories on why this happens are that the science curriculum becomes more controlled and there is a less autonomous atmosphere. Anxiety due to grades being linked to future careers or simply that science becomes decontextualized and irrelevant to student lives, and is simply perceived as difficult. Science curriculum needs to be aligned to work that scientists do in the real world and include open-ended questions and student directed tasks (Hellgren & Lindberg, 2017, p. 410). Hellgren and Lindberg (2017) went on to discuss when students are given opportunities to work toward solutions for problems that don't have known answers, their view of how scientific knowledge is developed as well as their future plans in regard to science can change . In current science curriculum, we focus on students rediscovering what is already known by scientists. When scientists were interviewed in a study of how a scientific tool was developed and then utilized by a high school science classroom they all argued that "students were better off focusing on scientific processes and developing reasoning skills, especially in light of the vast amount of ever increasing content and information" (Waight & Abd-El-Khalick, 2011, p. 55). The internet allows for information to be found at an instant. Why focus on memorization and regurgitation when we could be teaching our future generations how to use that information and question it?

One study on a curriculum, called Biomind (Zion et al, 2004), is unique in that it focuses on teaching inquiry procedures to help students practice the skills they need to explain phenomenon. Students completed a full cycle of inquiry and from questionnaires, analysis, and written reflections of students, there was evidence to show that students

understanding of the concept did improve. The inquiry process included the four components of inquiry which include: wandering, collecting data, studying data, and making connections. This curriculum asked students to generate their own research questions and practice reflective practices on how and why they obtained certain results. The social aspect of the learning process is highlighted in this study (Zion et al., 2004, p. 65). The social aspect and ideas surrounding collaboration and teamwork can help build strong communities within schools. Even though AEPs can individualize a students' educational experience the school setting still needs to foster and promote the practice of social skills for all students. When students experience authentic inquiry-based learning their self-efficacy increases. Students need to believe in their own abilities, to gain confidence when faced with difficult tasks, and maintain positive attitudes toward science. Lessons taught using authentic inquiry-based learning increased their skills not only in mastery experiences, where they completed tasks, but also their social persuasion skills. Students working in groups saw that others succeeded but also failed (Fernandez, 2017, pp. 6 & 12). This is important for students to see when we are trying to foster resilience among students who are used to failing. The goal should not simply be to get a diploma but to prepare students to be productive citizens. Too often an alternative program can become a credit factory.

The need for challenging curriculum is integral for giving students an education that helps them develop their own creativity, problem-solving, and innovation skills. The STEM education initiative clearly defines the need for curriculum to be transdisciplinary. Students need to develop skills in research and problem-solving which require

information from multiple disciplines (Strimel, 2014, p. 8 & 13). To create a curriculum that is truly authentic the lessons need to meet the following criteria:

- Provide a real-life situation
- Present an ill-structured problem
- Allow multiple perspectives
- Require collaboration
- Permit a student voice in selecting learning
- Drive student investigation and research
- Require quality solutions
- Authorize multiple outcomes
- Allocate time for reflection (Strimel, 2014, p. 10)

The development of challenging transdisciplinary curriculum is messy and can be difficult to create. Students need to be given opportunities to engage and struggle with literature that is unusual to them. They need to be exposed to different cultures and literature across time and genres. Authentic literature can motivate students to enjoy and value reading. They learn content more efficiently and effectively. Curriculum that utilizes authentic tasks and literature students can maximize their understanding of specific concepts and skills (Ciecierski & Bintz, 2015, pp. 17-18).

Some challenges to implementing authentic inquiry-based learning are that it is labor intensive and teachers may be uncomfortable with their changing role from a leader to a facilitator. Also when students have not been exposed to this type of learning there can be issues with engagement at first. “The vastness of science content that needs to be

covered overwhelms teachers and causes conflict between quality and quantity" (Wyss, Dolenc, Kong, & Tai, 2013, p. 52). Teaching with this type of curriculum is very time consuming and without comprehensive research and pressure to increase graduation rates and test scores many teachers utilize a more teacher-centered textbook heavy curriculum (Wyss, Dolenc, Kong, & Tai, 2013, pp. 51-52). Another obstacle that can affect the implementation of this type of learning is that students in an alternative setting need access to varying subjects and classes which consist of a range of ages within one classroom. There is a constant turnover within the enrollment of these schools and major attendance issues. Authentic instruction also requires more materials and thus funding for these classrooms. Yet when teachers discontinue the use of textbooks more funding can be diverted to other resources (Dennis & O'Hare, 2010, pp. 8-13). Yet even with these challenges facing alternative settings, there is a flexibility and less bureaucracy to get through in order to implement these changes. Often times I simply have to walk across the hall to speak to the principal about accessing resources, going on a field trip, or student concerns.

Alternative settings have the ability in their structure to allow for this type of curriculum to be developed. They are small and have the ability to develop the positive and trusting relationships that can foster resilience and confidence within their students. There just needs to be more organization and true efficacy amongst the staff. Although there are many challenges for designing and implementing authentic curriculum, I feel that it could benefit the marginalized students that are enrolled in these programs the most. When students gain skills in self-efficacy, social skills, critical thinking, and

problem solving to name a few, they have a much better chance of being successful later in their lives. This is critical to students who are considered at-risk. They need to gain these skills before they no longer have access to the structure and support of their schools. Educators are able to decide how to create these experiences for students and using authentic curriculum allows students to give their own perspectives and in turn see the value in their education (Phillips, 2011).

Student Motivation and Mindsets in Alternative Programs

"The underlying mechanism for students to have their own agency in finding out new knowledge is intrinsic motivation" (Ng, 2018). When educators understand why a brain is motivated they can then help change mindsets. Learners with growth mindsets tend to become lifelong learners and are not deterred by failure or difficulty. Studies have shown that when the growth mindset if fostered there are positive effects on student motivation and academic success. A growth mindset intervention can have a great impact on student outcomes especially in subjects such as math and science. Intrinsic motivation is inherent and develops from reflection of experiences. Studies have shown that intrinsic motivation greatly affects academic achievement and the pursuit of certain interests which in turn drives growth and learning (Ng, 2018). This evidence shows the importance of helping or intervening within the mindsets of alternative students. If students have low intrinsic motivation toward science or school in general due to negative past experiences curriculum, focusing on growth mindset interventions could greatly impact the academic success of students. In a study on the factors associated with student resilience in alternative educational programs, resilience is defined as "attaining

positive results in the face of adverse or threatening conditions, successfully handling traumatic experiences, and evading negative courses associated with risks" (Zolkoski, Bullock & Gable, 2016, p. 232). The ability to overcome adversity is influenced by the social interactions that surround us. Resilience is an ecological experience, the way that we as educators interact with students and set up the social norms of our classrooms will greatly affect their capability to cope with difficult situations. Student participants in this study described their teachers in positive ways which was in contrast to their experiences within the traditional setting. They described their teachers in alternative settings as kind, caring, helpful, understanding, and passionate (Zolkoski, Bullock & Gable, 2016, pp. 232 & 237). The teachers in my school are given professional development that surrounds students dealing with poverty, trauma, and mental issues. It is a very difficult job and it takes very passionate people to stick with teaching in these settings. When teachers can change the experience of school from a negative one to a positive one, students mindsets and intrinsic motivations can change.

Mindfulness can help reduce stress and improve intrapersonal interactions and psychosocial interactions within school settings. Alternative schools are designed to deal with the many challenges that students deal with that labels them as at-risk. Many students in these settings are susceptible to challenges in maintaining emotional and behavioral regulation. According to Wisner and Starzec (2015), "Two components of mindfulness are: (a) a self-regulatory component involving maintenance of attention on immediate experience in the present moment, and (b) maintenance of an orientation of curiosity, openness, and acceptance" (pp. 245-246). If curriculum can be designed around

mindfulness we can help students deal with their stresses and negative feelings toward school in a positive way while also embracing the culture of science that promotes curiosity and maintaining an open mind. The small size of AEP's also contributes to students having more positive experiences in schools. Teachers in a traditional high school can see upwards of 155 students a day. This can make developing relationships with students very difficult. In my school, my classes are generally around 15 to 20 students and I see them for multiple hours a day over multiple years. We focus on team and relationship building, go on monthly field trips, and have advisory classes that greatly increase our ability to get to know our students on a more personal level. We are able to develop trusting positive relationships with our students and many students see school differently than they have in the past. "Positive relationships result in comfort and learning, negative relationships relate to frustration and often failure to learn" (Phillips, 2011, p. 682). Students who have negative relationships with teachers develop very negative attitudes toward certain subjects or school in general. Many times when class sizes are too big there are misunderstandings, cultural differences, or stress that can lead to students feeling that a teacher doesn't like them or has a poor attitude toward them. Social and emotional learning cannot be ignored when it comes to alternative programs. Many of the professional development opportunities geared toward alternative programs focus on those areas. When students are able to learn in an environment that fosters this type of learning and feel that teachers respect and believe in them, they become more self-determined (Phillips, 2011, pp. 682-693).

Alternative programs also can focus on students gaining some authority in what and how they learn. “At-risk students, who often attend alternative schools, have a tendency to feel marginalized, alienated, and overly controlled” (Phillips, 2011, p. 692). The curriculum that is implemented in AEPs that allows for students to have some autonomy in their education can be motivating and empowering to these students. Students also need to see what they are learning as relevant and of value to them. For students who have been disenfranchised in the traditional school setting having a personalized learning goal or problem to solve can make content worth learning. Phillips (2011) stated that in her study on authentic student-centered practices four themes continuously emerged:

(a) Positive emotions and relationships support and result in successful learning, whereas negative emotions and relationships hinder learning;

(b) Social learning is academically and personally consequential for students, both in and out of school;

(c) Learning occurs more easily and is more meaningful when it is explicitly connected to the real world; and

(d) A certain level of student autonomy during learning appears to be tied to achieving goals. (p. 680)

I feel that alternative programs that already focus on these themes are the perfect places to truly implement more authentic and inquiry-based curriculum. Science curriculum for disenfranchised youth needs to address student self-control and be safe spaces for students who have had negative experiences within traditional school settings. “The

planning and delivering of a science program needs to start from the students' experiences with the phenomena, and from their own connections to the subject and with the laboratory material (e.g., materials taken from places and experiences familiar to the student" (D'Elia and Wishart, 2014, p. 26). Having small class sizes, focusing on community building, and having multiple years of student teacher connections make this type of program not only possible within an alternative setting but also required.

Chapter Summary

To summarize, this chapter was a literature review of work done by researchers who realize the needs of alternative learners, the curriculum that is available and used in not only alternative schools, but high school science classrooms in general, research done that shows a need for authentic inquiry-based learning especially for disenfranchised youth, and lastly how mindset can both positively and negatively affect student academic success. Combing focus not only on science content in curriculum, but also students personal and social well-being through mindset and motivation driven intervention, AEPs have a real chance of changing a kid's path in life. When asking the question, *how can science curriculum surrounding authentic tasks be created for nontraditional high school students to increase motivation and rigor*, we need to look at all of the previously discussed factors. The experiences of students coming into alternative programs tend to be negative in regard to education, life stresses and curriculum that is thought to be irrelevant requires a curricular approach that addresses the whole child and content that is of value to the student.

Chapter 3 addresses how I plan to create a curriculum that can serve a marginalized population of students and help them become lifelong learners. The Understanding by Design (Tomlinson & McTighe) curriculum model as well as aspects from *STEM: Student Research Handbook* by Darci J. Harland, is utilized to create a curriculum designed to help students ask and answer their own questions. I believe that for students be fully engaged and find value in their education they need to be the ones asking the questions and the teacher plays the role of the facilitator and guide. Chapter three describes how to create a curriculum for alternative education students that hopefully allows for students instead of the teacher ask the questions.

CHAPTER THREE

Project Description

Introduction

Chapter 3 is a description of how I will create an introductory authentic inquiry-based science curriculum designed for alternative learners to help answer the question: *how can science curriculum surrounding authentic tasks be created for nontraditional high school students to increase motivation and rigor*? I explain how using differentiated instruction and the Understanding by Design (UbD) (Tomlinson & McTighe, 2006) curriculum model will help me create a curriculum that can engage and motivate students who are at risk in Alternative Learning Programs.

Creating a culture of science and collaboration is integral to the success of inquiry-based authentic curriculum. Students need practice in the nature of science and experimental design, they need to learn how to work successfully in a group, and they need to learn how to think critically and be problem solvers. When material is presented to them in a context that is unfamiliar or abstract, a lack of motivation and confusion is often the outcome. The following sections will give an overview of my project, an overview of the theories presented by Darling Hammond (2010) and Tomlinson and McTighe (2006), and why I chose to create a curriculum. I will also discuss the alternative setting this curriculum was designed for, a description of my project, and a timeline for implementation.

Project Overview

In order to help my students understand the context of what they are learning, I need to know more about their life experiences and be able to differentiate my lessons. What might be familiar and authentic to me may not be for my students. The context in which material is presented needs to spark the curiosity of the students. Students need to be able to transfer what they have learned to new situations. The curriculum needs to go beyond memorizing facts and vocabulary in order for students to be invested in it and see its value. "Learning is a process of making meaning one student at a time" (Tomlinson & McTighe, 2006, p. 22). The curriculum that I want to design needs to have multiple ways of being assessed and presented. It needs to help students see that knowledge is powerful and it can be a vehicle of transformation in their lives. The goal was to allow students to see how learning can answer questions that they themselves have, not just the textbook. They should be able to solve problems using the concepts of the nature of science to change their perspectives on the world and possibly those of others.

Context can legitimate learning for students. When an instructional framework helps students develop their own questions they can see how extending their learning is beneficial to them. This can be referred to as the "need-to-know" principle where students legitimate their own learning and thus make it intrinsically valuable. I think it is important to point out that authentic inquiry is not meant to develop students into experts in science content but instead to help them learn content that is valued by our society and see where those concepts fit into a functioning society. When students develop a sense of purpose in their learning they become problem solvers which may help them find their

own paths (Bulte, Westbroek, Jong & Pilot, 2006). This project was meant to give me a curriculum that could help my students become scientists and learn how to learn. I want my students to see the value of the scientific method as well as how to do quality research that can help in their own communities.

Theories

Many students are dealing with social and emotional issues that cause a lot of anxiety around school and working with others. I feel that in order to become confident and capable members of society they need to practice the skills of working in groups and collaboration in school. Seventy percent of jobs on the United States require skills that were not needed when the school system was designed. (Darling-Hammond, 2010, p. 2) The new skills that are demanded of our future workforce include:

- Design, evaluate, and manage one's own work so that it continually improves
- Frame, investigate, and solve problems using a wide range of tools and resources
- Collaborate strategically with others
- Communicate effectively in many forms
- Find, analyze, and use information for many purposes
- Develop new products and ideas. (Darling-Hammond, 2010, p. 2)

There is a need for a curriculum to incorporate those skills into the science content to give at risk students exposure to what is going to be expected in the workplace. They need curriculum that challenges them to build resilience and pride in their work. Many students who are at risk in this school are not thinking about college. They don't think they are capable or they hate school so much they would never want to keep going. The

economy of the future in the United States depends on the production of information products such as computers, education, and financial services. These careers demand higher education and every child needs to be given an education that sets them up for success in these fields. Not only do educators need to cover a huge amount of standards they also need to make sure they are giving their students practice and support in developing the complex skills needed in the 21st century. There needs to be a shift from the transmission-oriented style teaching to one that promotes reflection, creativity and problem solving (Darling-Hammond, 2010). Giving a marginalized group of students the best education possible can be life changing. They need to know that skills are learned not given by genes or wealth.

The competitive grading systems of the traditional high school system favor more advanced students and show students who face more adversity that effort does not always mean success. When students that do not learn the same as the those who benefit and thrive in the traditional system struggle they decide that school is worthless or that they are stupid. Grades focussed on the same assessment for every student work for some but are huge deterrents for others. Students need to feel safe, respected, and have a sense of community in order to invest in their own growth and learning. Even students who are gifted may become disenfranchised in school when they are not challenged or see school as simply a grade and not of value to them. For students to see their potential as adults they need to develop characteristics such as persistence when faced with challenges, ability to take risks intellectually and learn to take pleasure in their work (Tomlinson & McTighe, 2006). An alternative setting serves a huge range of students and differentiated

and understanding by design curriculum models can serve each of them all better than a one-size fits all model.

Due to the vast range of student background knowledge and experience both educational and social, a differentiated instruction and Understanding by Design (Tomlinson & McTighe, 2006) curriculum models could be very beneficial to the alternative classroom. Using formative assessment and a reporting system that resembles more of a portfolio of student learning will help meet students where they are at and help them become invested in their own learning. Grades should be given in "reference to clearly specified criteria and should not be based on a comparison with other students in the class" (Tomlinson & McTighe, 2006, p. 134). The small class size and ability to work with students for multiple years gives AEP teachers the unique capability of designing learning tasks geared toward individual students that a traditional setting teacher may not. Most students are in credit recovery, to help motivate and engage them lessons need to be individualized and differentiated.

The guiding principles for this type of differentiated instruction are:

- Focus on the essential ideas and skills of the content area, eliminating ancillary tasks and activities.
- Respond to individual student differences (such as learning style, prior knowledge, interests, and level of engagement).
- Group students flexibly by shared interest, topic, or ability.
- Integrate ongoing and meaningful assessments with instruction.

- Continually assess; reflect; and adjust content, process, and product to meet student needs. (Huebner, 2010, p. 80)

By using pre-assessments to gauge student motivation, ability, and background knowledge a curriculum can be designed that focuses around these central characteristics and better suit each child. There are so many variables that can affect a single reported grade such as participation, mindsets, work completion, attendance etc which can be extenuated in the AEP setting, a curriculum that can be tailored to students will give a much more accurate idea of each students' learning and ability.

Integrating Understanding by Design and Differentiation (Tomlinson & McTighe, 2006) is a curriculum writing model that I will be following to develop the curriculum that I hope to use to meet needs of the 21st century society. The curriculum that I created will give the teacher different roles that include direct instructor, facilitator, and coach. In this type of curriculum there will be opportunities for the entire class to learn together and also opportunities for students to learn independently and differentiation will need to be utilized. Within the Understanding by Design model there are three stages which I will follow to create my curriculum (Tomlinson & McTighe, 2006). The next section will discuss the choice of method for this project.

Choice of Method

The integration of Differentiation and the Understanding by Design curriculum model (Tomlinson & McTighe, 2006) made writing a unit plan that allowed for individualized learning. This is something that students in an alternative setting truly need. They may have learning gaps and each students has a huge range of experiences

that can affect how they learn. By using a template for UbD unit plans I was able to follow three stages that allows for students learn with autonomy and have choice in the activities. This section will describe the three stages.

In the first stage, students will be informed of the content standards and the learning outcomes of the unit. Essential questions need to be explored and the important knowledge and skills that need to be learned should be conveyed and discussed with students. (Tomlinson & McTighe, 2006). This is something that I do, but not as explicitly as I would like to with my classes. I will show them standards, but students also need to know why and how they are going to learn the knowledge and skills.

Stage two of the unit development should present students with the types of assessment that will be used to show evidence that they have gained knowledge. They should be made aware of the summative assessment that will be used and be shown rubrics so they know what is expected of them and how they are being assessed. Models of student work should be shared with the class, they need to know what quality work looks like (Tomlinson & McTighe, 2006). This will be difficult to begin with because I do not have model student work to show yet. I do already try to explain to students what type of assessment I will be using and why, but I feel that utilizing this with differentiation will cause students to be much more invested in their learning. I also believe that with thoughtful development of ways that students can convey their learning I will be able to differentiate more and allow for more authentic learning tasks to shape the way students construct knowledge.

The third stage of the unit design connects the direct instruction and the learning experiences with the summative assessment and the essential questions. It also allows time for students to reflect on their learning and how it will help them in the future performance tasks as well as their lives (Tomlinson & McTighe, 2006). I think this is the most important part of how I will be designing this curriculum. To make the learning tasks authentic to my students they need to see the connection of their learning. When students can't find the connections between their lives and how education can empower them, especially in an alternative setting they lose motivation and risk dropping out.

By using the foundation of this curriculum model and differentiation based on pre-assessments and formative assessment data I can produce units that allow for all students in this small setting to learn and see connections between the content I am teaching and the performance task they are completing. I needed to ask myself questions such as: How will I give directions? How will I keep students engaged and motivated? How will I know that students are learning? How will I implement transitions? How do I get students the resources they may need? I do believe that it is possible, especially in alternative setting. As Tomlinson and McTighe stated, the givens in our curriculum development should be the belief that:

> all students should work with the big ideas and essential skills of the topic, at high levels of thought on authentic tasks, with support for developing both understanding and skill, with opportunity to make personal meaning of important ideas, with teacher guided instruction to ensure clarity of understanding, and with

the student's full knowledge of learning goals and indicators of learner success. (2006, p. 88)

This method allowed me to create a curriculum that could be individualized to students needs and abilities, it makes science meaningful, and helps students practice skills they will need when they enter the workforce. The next section will discuss the setting that this project was designed for.

Setting

The school where this curriculum is intended for is in an inner-ring suburb with high poverty rates. The school is very small with around 80 students in a day program with five content area teachers and one special education teacher. There are two assistant principals and one office administrator. There are no counselors in the building or a nurse. The school is lacking in resources such as lab equipment, but we do go on monthly field trips to help build a sense community and relationships as well as to extend learning. The school implements a six period day with fifty-five minute periods and a twenty-minute advisory class.

The science classroom does not have an actual lab. It has tables and chairs, a white board and a smartboard. It does have four hot plates, chromebooks, sinks and access to a kitchen. There is a set of microscopes and a four Labquest interfaces as well as a variety of sensors various vernier attachments. The school is equipped well enough to allow students to participate in many lab experiments and experience a variety of phenomenon. There is a small school garden that the entire school participates in building, growing, and planting the seedlings, but if there could be curriculum that

incorporated it, the garden could serve our school much better. The school is near the Mississippi River and works with the city in various river clean-up projects throughout the school year. The setting allows for students to participate in many different experiences that could help them find purpose and value in their education.

Students attending this school come for a range of reasons. Most come from an IB focused high school and are in credit recovery. Some have anxiety and prefer the smaller setting. Some experienced trauma or family issues that took them out of school. Bullying is a very common reason for students to come to the alternative setting. Many students use drugs and alcohol and live very adult lives often having to care for siblings or help pay rent. The enormous range of reasons for students attending this school creates a need for individualized learning. Often when a student has had a negative experience with school they need help getting motivated to graduate. Apathy is huge issue in this school.

Increasing rigor and motivation through differentiation and authentic inquiry-based learning will give the students in this setting a better idea of the skills and knowledge they will need in the future. The following section will give a description of the curriculum that I designed.

Project Description

I created a six week unit plan surrounding photosynthesis and cellular respiration and how it is linked to the carbon cycle and global warming. The project is focussed on not only helping students learn the science of photosynthesis and cellular respiration, but

to also show students the value of the scientific method. To help students start to think scientifically and ask their own questions.

Much of this project was inspired by my work in an alternative setting and my experiences there. I have seen so many students struggle to see a value in their education which leads to students failing courses and some not graduating. Biology can be a very difficult subject for many students. The amount of content that the Minnesota science standards require does not allow for the time to explore science concepts indepthly enough to appreciate them in my opinion. Also, as I have stated in my literature review, many alternative students have endured traumatic experiences and may live very adult lives. School comes after survival. This curriculum is rigorous and incorporates collaboration, technology, inquiry, and presentations to push students and help them gain confidence in their own abilities. Many students whom I have taught are capable and very intelligent, but they are lacking confidence and skills that they may have missed in previous grades. There is not lacking of ability in most cases just a lack of motivation and confidence.

Attendance and students moving schools is an issue that needs to be addressed in alternative programs. Students can have large gaps in their learning, so multiple standards can be taught together and give students content they may missed in the past. This unit has embedded concepts into standards that are often taught isolated from one another in the traditional setting. I wanted to integrate them. I wanted to help students see that science is not isolated, that it is all connected.

This unit plan covers the following Minnesota State Standards:

- 9.1.3.3.2 Communicate, justify, and defend the procedures and results of a scientific inquiry or engineering design project using verbal, graphic, quantitative, virtual, or written means.
- 9.1.1.2.1 Formulate a testable hypothesis, design and conduct an experiment to test the hypothesis, analyze the data, consider alternative explanations, and draw conclusions supported by evidence from the investigation.
- 9.1.1.2.2 Evaluate the explanations proposed by others by examining and comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the scientifically acceptable evidence, and suggesting alternative scientific
- 9.4.2.2.2 Explain how matter and energy is transformed and transferred among organisms in an ecosystem, and how energy is dissipated as heat into the environment.
- 9.4.1.2.4 Explain the function and importance of cell organelles for prokaryotic and/or eukaryotic cells as related to the basic cell processes of respiration, photosynthesis, protein synthesis and cell reproduction.
- 9.4.2.2.1 Use words and equations to differentiate between the processes of photosynthesis and respiration in terms of energy flow, beginning reactants and end products
- 9.4.4.1.2 Describe the social, economic and ecological risks and benefits of changing a natural ecosystem as a result of human activity. For example: Changing the temperature or composition of water, air or soil; altering the populations and communities, developing artificial (MDE, 2009).

This is a lot of material to cover and practice. I think that this six week unit will allow for students to be engaged, become curious, and develop a scientific way of thinking about their world.

Timeline

This curriculum should be implemented earlier in the school year to help students gain the skills they will need for a science class throughout the year. I think that it could be introduced within the first month of school. Also because there are multiple standards taught together it can be be used when there is a gap in learning. The goal of this project was not only to create a unit but to also change the way I write all of my units. After meeting my classes at the beginning of the year and as they change through trimesters I can use this method to create units and lessons that are focussed on my individual students not just the standards I am supposed to teach. This allowed for more streamlined lesson planning and I believe will save me a lot of time in the future.The final section is a summary of chapter three that reflects on what I have learned and main emphases of the chapter.

Chapter Summary

Alternative Learning Programs present challenges for educators with vast range of students skills, experiences, and background knowledge. The reasons for students enrolling in AEPs often put them at risk for dropping out of school and not being prepared for the future workforce of the 21st century. All students deserve a challenging and high quality learning experience that provides them with skills in problem solving, critical, thinking, creativity, and resilience.

Utilizing the differentiation and Understanding by Design curriculum models (Tomlinson & McTighe, 2006) I hope to create a curriculum that meets those needs and gives students who have been disenfranchised by the traditional educational setting and chance for success and see the value of their education. The small class sizes and ability to build relationships with students over multiple years will allow for learning to look differently for each student. Taking the time to develop a curriculum that gives autonomy and choice in learning has an opportunity to peak student curiosity and see that extending their learning is an investment in themselves. Authentic inquiry-based learning will allow for students to ask their own questions and find their own answers. I believe that the creating curriculum that encompasses the ideals of differentiation and Understanding by Design (Tomlinson & McTighe)) will hold teachers and students to high standards and give many students a second chance at success.

Chapter 4 will allow for reflection on the curriculum design process and my thoughts on how this curriculum design will work for students in an alternative setting. It will take into account the expertise of other teachers in both the traditional and alternative setting. I will compare what I create with the curriculum that is out there presently and comment on how I believe it meets the science standards that the state of Minnesota requires.

CHAPTER FOUR

Conclusion

The process of developing a curriculum for a biology class at an Alternative Education Program has given me the ability to reflect on how I create lessons and learning opportunities. *Integrating the Understanding by Design and Differentiated Instruction* models, as written about by Tomlinson and McTighe (2006), gave me the ability to clearly state what outcomes I wanted for my students and allow students to be invested in their own learning. They are able to ask their own questions and design their own experiments.

Chapter four discusses how the process of creating this project answers my research question of: *how can science curriculum surrounding authentic tasks be created for nontraditional high school students to increase motivation and rigor*? It discusses what I learned through the research process and what parts of the literature review proved to be the most valuable and applicable to the students within an AEP. Possible implications and limitations of this type of curriculum writing will be reflected upon. There is a hope that this type of lesson could be utilized in the traditional science classroom as well. The last part of this chapter discusses how what I have learned affects future projects, how this project can be shared with others, and the benefits that this project could give to the teaching profession.

Major Learnings

Teaching is not simply providing resources and lessons to students. Motivation and engagement need to be addressed as well, and students in Alternative Education

Programs may need extra time to see the value in what they are learning. The unit plan that I created allows for students to ask their own questions, and to design their own experiments to answer those questions. This way of learning will hopefully help them become curious enough to then answer their own questions. Students who may not have had success in the traditional classroom need opportunity to see how what they are learning applies to their own lives. I believe that this project has created lessons where students can see the connections between photosynthesis, cellular respiration and climate change. This type of curriculum can be applied to all science topics. Allowing students to have a say in how they are going to learn a topic gives them more investment in their education. They need to see that science content is all connected and not isolated. Students in AEPs tend to have gaps in their learning, so being able to teach multiple standards in a unit in-depthly can help get them back on track.

During the research process, I was able to see supporting evidence for the need for authentic inquiry-based learning tasks in Alternative Learning Programs. Authentic inquiry-based learning grants students a say in how they are going to experience learning. Student voice is needed in curriculum, all of the players in education need to involved with how it is designed. Often it seems that students are left out of that discussion. "Student voice is composed of perceived relevance of learning topics, differences in students' life perspectives, resources students bring to their learning environments, and the awareness teachers have about their students' lives" (Phillips, 2011, p. 674). Small class sizes as well as having students for multiple years in an AEP gives teachers the ability to build relationships with students and develop curriculum that takes into account

student voice. Knowing students' strengths or lack of skills in an area can help teachers create lessons that are differentiated and individualized for their students.

Motivation can be a huge challenge for teachers and students in AEPs. Students need a better understanding of how their own experiences are related to the science content they are learning. Curriculum needs to increase not only the students' understanding of science, but also their interest in science careers and scientific thinking (Hellgren & Lindberg, 2017). Providing real-world situations that are current and spotlighted in the media allows students to bring some prior knowledge to a lesson. In the curriculum that I developed, I wanted to use climate change as a problem for students to analyze. Climate change is a topic that has multiple perspectives, is in the media daily, and affects all of our lives. For learning to be authentic there are certain criteria that need to be met. Greg Strimmel (2014) stated that students need to be provided with real-life situations, collaboration needs to be required, multiple perspectives need to allowed, and multiple outcomes need to be valued (p. 10). I followed this criteria to create my curriculum. I now will try to always use that criteria as a sort of template for my curriculum writing. Integrating that criteria with the UbD model with differentiation from Tomlinson and McTighe (2006) gives the ability to individualize learning and create authentic learning tasks that can motivate students who don't learn in the traditional setting. Allowing for individualized learning gives students a voice in their education.

Revisiting the Literature

The research in my literature review shows that education needs to go further than memorization and regurgitation of facts. Students need to be taught to think at a higher

level. They need to learn to learn. To ask testable questions that they can experiment with. They need to learn skills that go beyond the classroom and standardized tests. As educators we need to ask our students to "analyze, synthesize, and evaluate information" (Dennis & O'Hair, 2010, p. 4). When information and skills are presented isolated from one another and without real-life application they are seen as useless. Especially in an alternative setting where students are already at risk of dropping out of school and not graduating. The next section will review what I learned about my perceptions of education and possible implications of my project.

Implications

As a relatively new teacher, I have struggled with the question of how to motivate students to want to learn in the alternative setting where I work. What I find fascinating and mind-blowing is boring and useless to many of my students. Through the process of researching how to create curriculum for students in an AEP, I have found some answers. As students move from grade to grade student agency and autonomy in their learning declines. There are labs and lessons that are presented to them and one answer to find. Often the answer is already given, they are just asked to prove it. Conducting this literature review gave me a similar answer from over twenty sources. A resounding call to allow students more voice in their education. To do this educators need to know and understand their students. Alternative programs have the ability to offer this type of setting to students. Relationships are integral to student achievement. With a positive and supportive relationships between staff and students, learning can happen. So much of

what I read and learned revolved around using education as a transformative tool to help students see their potential and build confidence.

There is a stigma attached to Alternative Education Programs. A stigma that students in these setting are there because they can't learn, or that their lives are so chaotic that we just need to get them to graduate. This is where the real damage comes from. When we think that graduating is the goal. It is not. This project has opened my eyes to that. The goal is to prepare our future citizens to the world they will be tasked to survive in. The goal is to give these future citizens the tools and skills to be successful in a world full of opportunities. Worksheets and standardized tests do not hone skills that are needed in the real world. Curriculum needs to center around students learning how to research, to answer their own questions, to ask questions. The most transformative aspect of this project was that I learned that academics and relationships both need to be represented in a successful program. Although AEPs are focussed on relationships and helping students through traumatic and stressful situations we still need to prepare them for the future. It does not have to be one or the other.

Science content can be used as a transformative tool to help students achieve higher order thinking and see themselves in careers that they may not have seen possible before. Authentic inquiry-based curriculum can be life changing for students who have never seen themselves as successful in school before. Limitations and how this project can be used in the future will be discussed in the next section.

Limitations

Time is always a challenge for every educator. In alternative settings that is compounded by the fact that on top of the huge amount of standards that need to be taught in a year, students can have gaps in their learning. When sitting with a student to help him with his chemistry assignment he told me it was pointless because he has not paid attention in science since the sixth grade. One of the goals of creating this type of curriculum was to embed multiple standards to help students bridge those gaps. I think that a curriculum for students who have learning gaps needs to act as an introduction to the scientific method and scientific thinking or as reinforcement of past learning. The idea that science is a way of thinking, is a way of looking at the world in an unbiased way, needs to be shown to students. They need to see that these concepts can be utilized for the rest of their lives not just for the week-long unit when it was introduced.

This can be a very overwhelming type of learning though to students who are new to it. Many students transfer to an alternative program in the middle of a trimester or semester. Students may be coming from a treatment facility or coming back to school after a traumatizing event. Anxiety is a struggle for many students that I work with and collaborating and group work can cause problems in the classroom. With that said though I believe that even being exposed to this type of curriculum and practicing even a little at a time can help many students overcome their anxiety. Building relationships and confidence among a marginalized population can be life-changing for students. They need to know that they are capable and can push themselves. When teachers give control to the students they need time to practice.

Another limitation to this type of curriculum and way of learning is that it is not the norm in many classroom settings. Learning being thought of as taking notes and memorizing facts has been how many students have experienced school for years. To change that can be uncomfortable and scary to students. In my own classroom when presented with designing an experiment, students will ask for a worksheet or something easy. Changing the way our students think about their own learning takes time and effort that teachers need to make time for.

This type of curriculum will be used as a template for how I create lessons in the future. I think it is also applicable for every content area as well. When students can use what they learned to solve a problem by asking their own questions can transform how we teach. We need to show our learners that what you learn in the classroom can be applied to their own lives. They need to understand the value of multiple perspectives. They need to understand how to analyze evidence and make real observations. They need to realize the difference between facts and opinions and what credible sources are. In the future, I plan to take all of the units I teach and integrate authentic inquiry and the UbD model to make more student-centered lessons. This maybe bo only one or two units a years, but eventually I believe my teaching and more importantly student learning will improve. The following section will discuss how what I have learned will affect future projects, how I plan on sharing and communicating what I have learned, and how this project benefits the teaching profession.

Communication, Benefits, and the Future

The ability to collect and analyze data and research on a topic was a huge asset to my teaching. Learning how to create a literature review to backup my perspective is incredibly valuable in the digital information age that we live in. There are so many theories and new fads that are constantly being brought into schools. Knowing how and where to conduct research has truly opened my eyes to the power in validating your ideas. This project has made me truly look at how I assess my students learning. It has made me reevaluate the value of the lessons that I teach. Graduation should not be the goal of teaching, preparation for the being a successful citizen is. My next projects will have that view in mind always. Working with other educators will now require a deeper conversation.

I plan on sharing my unit plan with anyone who wants to use it. I hope people would want to use it. I plan on taking notes and collecting data on how students respond and learn with this type of curriculum. Sharing that data in a professional development session in my district would be a next step for me. After creating this project I now need to evaluate how it works. I need to ask the next questions. Such as does this type of teaching give better standardized test results? Does that matter in an alternative setting? How am I assessing students fairly? Is there enough time to give the feedback required to make these lessons effective? How do I help other educators use these ideas? This project and program has opened my eyes to the idea that learning needs to be fluid and on-going. When we finish a unit that doesn't mean it is never revisited again. Learning a

new teaching strategy does not mean we as educators stop learning. Our students are ever changing and we need to be able to change with them.

Teachers in alternative settings need to see that their students are capable and need doors opened for them, not shut. I think that holding students to high standards and giving them real problems to solve is a way to improve education in AEPs. With limited resources and teachers teaching outside of their license area, the way students are taught in an AEP cannot be worksheets and packets. Students who need the most tend to get the least in that regard. When all that we give to students is a worksheet or notes to copy down, they believe that is all they are capable of. Our future citizens need to see that we can all learn from each other. They need to know there is more than one answer. They need to understand how to utilize the power they are given with the internet at their fingertips. My hope is that this project can show educators in alternative settings that their students deserve the best education out there and that they are capable of giving it to them. They need to know that their students have the ability to solve problems and ask questions. Our job is to show them the value in that knowledge and how to use the tools they have.

Conclusion

In conclusion, this project has given me insight into how knowledge is truly acquired and constructed. It has made me take a very reflective and analytical look at my ideas of teaching in an alternative setting. There needs to be equity in education, and often Alternative Learning Programs are lacking in quality resources. Yet these setting have the structure and flexibility that can give students a quality authentic education. The

small class sizes and relationships that can be built to allow for differentiation and individualized learning that can transform a student's life. We need to be teaching skills and mindsets that will empower our students. This project has given me insight into what it means to be an alternative learner, what authentic inquiry-based learning is and its benefits especially in an alternative setting. As an educator, it is my job to teach everyone that comes into my classroom. This project has given me a new tools and strategies that I believe better equip me to serve all of my students.

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